

INFORMATION

RESPECTING THE PROPOSED

MARINE TRANSPORT RAILWAY

ACROSS THE

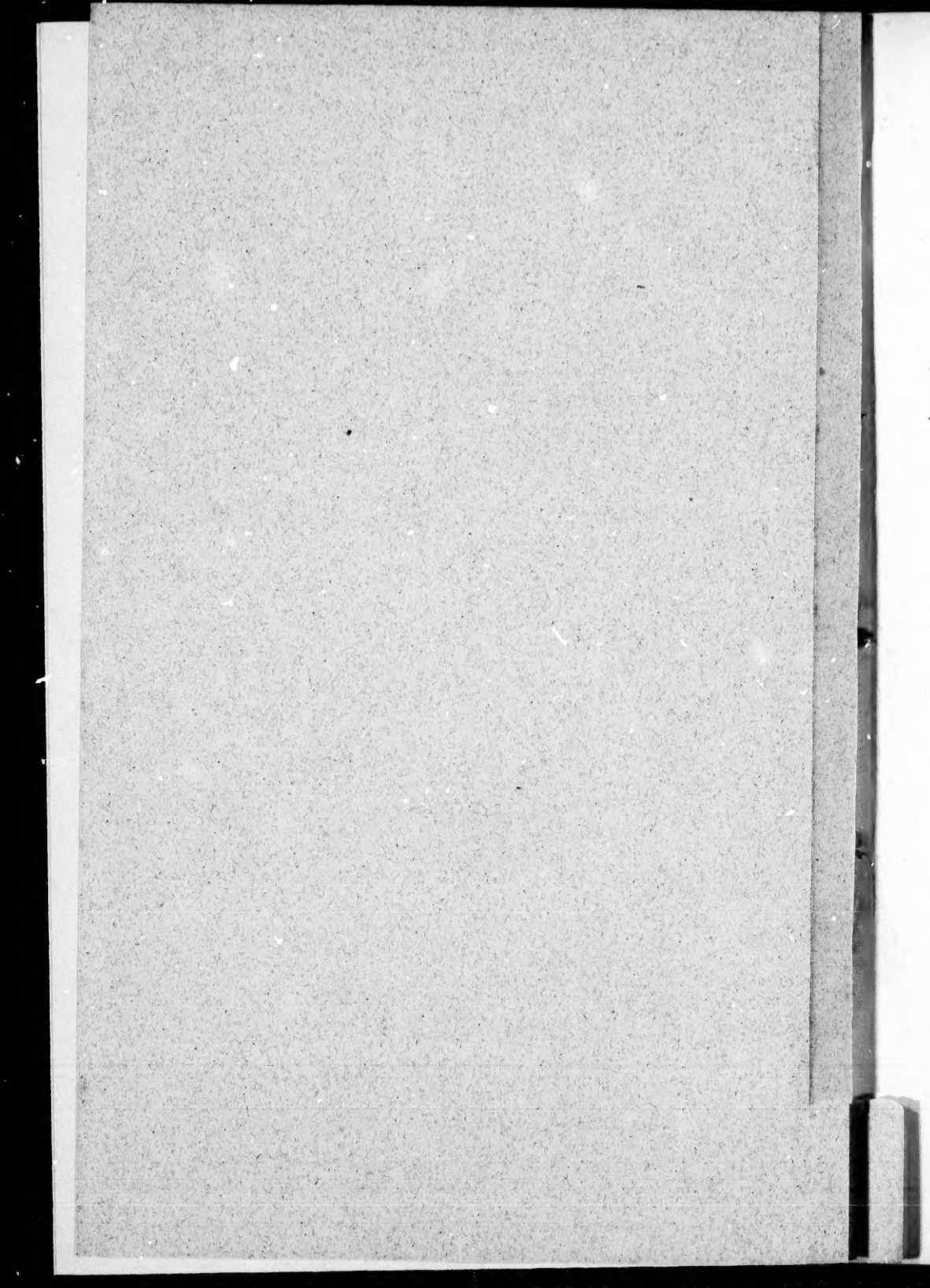
ISTHMUS OF CHIGNECTO.



Printed by Order of the Privy Council of Canada.

OTTAWA:
PRINTED BY MACLEAN, ROGER & Co., WELLINGTON STREET.

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CHIGNECTO MARINE TRANSPORT RAILWAY.

OTTAWA, February 3rd, 1882.

THE HONORABLE

SIR CHARLES TUPPER, C.B., K.C.M.G.,
Minister of Railways and Canals.

SIR,—On the 7th November last, I had the honor to forward you a proposal for the construction, operating and maintenance of a Marine Transport Railway across the Isthmus of Chignecto, combined with a Railway of the standard guage partly running alongside of the same from Amherst to Cape Jourmain or Cape Tormentine.

Since that date I have made actual surveys of the locality and caused a line of levels to be run over two different lines of the Marine Railway—one line being that indicated in the proposal above referred to, and the other an entirely new location.

LINE No. 1.—*Coloured Green on plans.*

The first line starts from the Ox Bow, near Emory's Landing on La Planche River, crosses the Intercolonial Railway near Amherst Station by Robb's Foundry, thence proceeds to the Tyndall Road where it intersects Mr. McLeod's survey line, thence it follows the said survey until it intersects the canal line of Messrs. Keefer and Gzowski, which runs nearly parallel with it to its terminus near Tidnish Head.

This line is perfectly practicable. There are in the aggregate about five miles of a gradient of 1 in 500, which is the maximum, the remainder of the line being level. There are also three curves on it of about 35,000 feet radius, which is the minimum. The summit cutting on a spur of land which projects from Tyndall Road is about 40 feet deep and half a mile long. The length, including allowance for pier projecting into Baie Verte, is eighteen miles.

LINE No. 2.—*Coloured Red on plans.*

The newly surveyed line of Marine Transport Railway referred to commences at the monument indicating the beginning of Messrs. Keefer and Gzowski's canal location at the mouth of La Planche River, thence running *perfectly straight* in a direction of about N. 70 E. by the magnet and terminating at deep water between Tidnish Head and Week's Point, so called.

I have great satisfaction in reporting to you the discovery of this line, for it not only fulfils the conditions of a perfect Railway, being both straight and nearly level, but it is actually cheaper to construct as well as maintain.

The terminus in Cumberland Basin was that recommended for the proposed canal by the eminent engineers above mentioned, and that in Baie Verte is nearly the same as was resolved upon for all canal lines.

Therefore no objection can be reasonably made to the approaches for vessels at either end.

This location avoids the floating Bogs marked on the canal plan, and where soft, marshy places exist good sound foundations have been proved at about six feet six inches from the surface.

As to the foundations at the mouths of the Missiquash and La Planche it consists of a bed of clay, hard-pan, and gravel, covered with loose stone and stumps of underground forest. This bed varies from about 10 feet in depth at half tide to 4 feet at low water, the whole resting upon rock. The extent of beach covered with boulders, etc., is about one-half mile ($\frac{1}{2}$) in length by one-third ($\frac{1}{3}$) mile in breadth from low water channel towards shore. A good foundation, therefore, may be relied upon for the hydraulic lift.

From actual measurement, this line is, from water to water, 89,000 feet, or $16\frac{85}{100}$ miles long. With the length of pier at Tidnish added, it may be called 18 miles.

In consequence of the difference in the high tide levels between Bay of Fundy and Baie Verte—the latter being 17 feet lower than the former for ordinary extreme high water and 23 feet lower than the Saxby tide—it will be necessary to have a descending gradient towards the Gulf of St. Lawrence sufficient to insure good drainage and make up this difference of level.

I do not hesitate to recommend the adoption of this line.

It will be easier to work and maintain; it requires no complicated ship carriage; there exists no such heavy summit cutting; it can be more quickly constructed than the other line. It will, therefore, be more presentable to capitalists, who would be more likely to embark in such enterprise than in a line not perfectly straight or so nearly level.

I am justified, for the above reasons, in believing that a lesser sum would be required from the Government for the support of this line than would be necessary for the first line named.

A subsidy of one hundred and fifty thousand dollars per annum for twenty-five years is all that is now asked by the company from the Government; the company will take all risk, and no payment will be required until the object is accomplished and it can be proved to the satisfaction of the Government that the said Marine Railway will serve all the purposes for which the Baie Verte Canal was proposed. The annual cost to the Government will be about one-fourth that of the proposed canal, taking into account interest and maintenance. It can be more speedily constructed. It will be more expeditious in transit. It will be open earlier in spring and fall when the canal would be encumbered with ice, and before navigation is open through the Gut of Canso. The lifts can be utilized as graving docks. The docks can be used as shipping ports at either end independently of the marine railway.

For the Cape Railway, as a necessary auxiliary in the construction and operating of the Marine Transport Railway and running alongside of the latter for a portion of its length, as represented on the plan, a subsidy of four per cent. upon its cost, as estimated by Mr. Schrieber, Chief Engineer of Government Railways, for a like period, would be necessary. This railway might be commenced early in the coming summer, should the Company receive such assurances from the Government as would justify them in getting out timber and sleepers and commencing other preparatory work during this winter.

In such an event this railway might be opened for traffic by the end of the year.

The Marine Transport Railway can be constructed in two and a-half years, and perhaps less, if commenced simultaneously with the Cape Railway. Considerable time will be required to consolidate the earthworks before commencing on the permanent way.

In addition to the subsidies before mentioned, I ask, on behalf of the company the following privileges :—

The entry free of duty of all rails.

The entry free of duty of such materials and machinery required for the hydraulic lifts and other purposes as are not made or manufactured in Canada.

The carriage free, of all such materials over the Government Railways.

In conclusion, I have to inform you that a Bill has been fyled by me for the incorporation of a Company to be styled the "Chignecto Marine Transport and Cape Railways Company," with a capital of \$5,000,000, for the construction, equipment, operation, and maintenance of the above Railways, and to obtain from Parliament all necessary powers to acquire lands and carry out the said undertakings either separately or combined ; and that in the event of the Government desiring a location of the Cape Railway, other than that alongside of the Marine Railway, the Company will adopt any other location approved by the Chief Engineer of the Government Railways, separate and apart from the Marine Railway.

The Company will place a suitable steamer for Ferry purposes, between the terminal stations of the railway across the Straits of Northumberland, and will run the same in connection with all through trains at least twice a day during the season of open navigation, for the sum of eight thousand dollars for the season.

In regard to winter service, the Company will make a more definite proposal after observations have been taken and trial trips made.

I have the honor to be, Sir,

Your obedient servant,

H. G. C. KETCHUM.

As a member of the above company, I will engage and undertake to carry out the steamboat arrangements above referred to.

R. G. LUNT.

OTTAWA, Feb. 13th, 1882.

THE HONORABLE

SIR CHARLES TUPPER, C.B., K.C.M.G.,

Minister of Railways and Canals.

SIR,—I beg to offer the following reasons for combining the Cape Railway with the Marine Transport Railway :

1. The Docks of the Marine Railway are proposed to be commodious enough to accommodate a large railway business other than that of the transportation of vessels. For instance, an entirely new outlet and shipping port will thus be provided on the Gulf of St. Lawrence at Tidnish Head by rail for the collieries of Spring Hill and the "Chignecto," "Blyght," "St. George" and "Styles" mines on the River Macan.

2. If the Cape Tormentine Railway be carried alongside as proposed and con-

nections made with the docks, steamers and vessels calling at Baie Verte, but whose entire cargo is not destined for Bay of Fundy or beyond, may discharge part of it at Tidnish Dock to be delivered at stations along Intercolonial Railway, or it may be re-shipped at Amherst Dock into other vessels, if required.

3. If the Cape Railway were built as proposed, alongside of the Marine Railway, it would be a great auxiliary in the construction and operation of the latter. The Gulf being closed by ice for five months, the Marine Railway would not be required, and all traffic on it would for that time be suspended; and unless the Cape Railway afforded employment for the operatives, they would either have to be discharged or kept idle at the expense of the company.

4. The Marine Transport Railway could be more expeditiously built with the assistance of the Cape Railway running alongside to transport rails, timber, stone for masonry, rock ballast, machinery and other requisites for the hydraulic lifts, stationary engines and docks.

6. The Marine Railway being a perfectly straight line, and also nearly level, with gradients of only five feet to the mile, whilst the "separate" line to Amherst has gradients of over 40 feet to the mile, it follows that if the Cape Railway were located alongside, the line would be infinitely superior, and capable of carrying goods at cheaper rates and greater speed. The same quantity and width of land taken might cover both lines, and the distance to either Amherst or Intercolonial Railway is not increased by the combination.

7. For similar reasons it is superior to any proposed line from Baie Verte Village to Sackville, and half a mile shorter than such line, calculating the distance from Baie Verte Village to the Intercolonial Railway.

There, therefore, appears to be no great reason for keeping them separate, either in location or for operation.

I have the honor to be, Sir,

Your obedient servant,

H. G. C. KETCHUM.

OTTAWA, February 20th, 1882.

THE HONORABLE

SIR CHARLES TUPPER, C.B., K.C.M.G.,

Minister of Railways and Canals.

SIR,—I have the honor to enclose you an Estimate of the probable Traffic to be developed by the construction of the Chignecto Marine Transport Railway.

This Estimate is compiled from the testimony published in the Report of the Canal Commission in 1871, and the evidence taken before the Baie Verte Canal Commission in 1874, also from the Tables of Trade and Navigation, and supported by oral testimony of the most reliable character,

It must be remembered that the Trade of the Dominion affected by the proposed short cut through the Isthmus, has increased immensely since the Canal was considered, and taking into consideration the still greater development that would ensue on the completion of the short Isthmian Transit, the Estimate may be safely

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relied upon as forming a good idea of the volume and kind of traffic that may be then expected to pass over the Isthmus.

I have the honor to be, Sir,

Your obedient servant,

H. G. C. KETCHUM.

CHIGNECTO MARINE TRANSPORT RAILWAY.

ESTIMATE OF THE PROBABLE TRAFFIC TO BE DEVELOPED BY THE PROPOSED ISTHMIAN TRANSIT.

ARTICLES OF COMMERCE.	FROM.	TOWARDS.	TONS.	AUTHORITY.
<i>Products of the Forest.</i> —All kinds of short or small lumber, planks, deals, boards, battens, scantling, clapboards, cedar and pine shingles, laths, palings, pickets, ship timbers, knees, masts, spars, cedar sleepers, pine hachmatac railway ties, telegraph poles, spiling, hemlock bark, hemlock boards, staves, hoops, sugar, box shooks, block ash, elm, maple. Pine boards, oak, elm, walnut, ash.	The north shore of N. Brunswick, N. Scotia, Bay Chaleurs and Gaspé Basin. Estimated at forty million superficial feet. Quebec.	St. John, United States, West Indies, Guiana, Brazil, Buenos Ayres.		Senator Mulrhead. W. Elder, M. P. P. Ed. Jack, C. E. F. C. Winslow Hon. J. W. Lawrence. Hon. J. Boyd. J. Pickard, M. P.
		Total tons...	80,000	
<i>Products of the Western Provinces.</i> —Flour, meal, barley, oats, corn, wheat, pork, beef, hides, mineral oil, agricultural implements, machinery and other heavy manufactures, phosphates, ores, &c.	Montreal, Toronto, Chicago, and all lake ports.	Coming in the lake propellers to St. John, can there exchange for southern products and coal, plaster and stone.		J. Pickard, M. P. Hon J. Young at meeting of Dominion Board of Trade in 1871, Hunsard 78, p. 144.
		Total tons...	50,000	
<i>Agricultural and animal products from Prince Edward Island and Cape Breton</i> (west coast).—Potatoes, roots of all kinds, oats, beans, peas, pressed hay, lard, tallow, wool, horses, cattle, sheep, swine, dairy produce, poultry, hides, pelts.	Ports of Charlotte-town, Summerside, Georgetown.	To St. John, Portland, Boston, Providence, New York, West Indies.		C. Burpee, M. P. Hon J. C. Pope J. C. Hall. W. Elder, M. P. P. Hon. J. S. Carvell.
		Total tons...	50,000	
<i>Products of the Sea and the Fisheries of the Gulf of St. Lawrence.</i> —Fish of all kinds, cured, frozen, pickled, canned, dried or alive: cod, halibut, mackerel, ling, pollock, salmon, capelin, herring, smelt, alewives, lobsters, oysters; also cod, seal, porpoise and whale oils.	Labrador, Anticosti, Bay Chaleur, Gaspé Basin, P. E. Island, and the Gulf waters generally and from Quebec.	Ports of the United States, north and south, Cape Cod, New Bedford, Gloucester, New York, New Orleans, West Indies, Brazil, Buenos Ayres.		R. G. Lunt. J. C. Hall. W. Elder, M. P. P. Hon. R. Marshall. C. Milner. Alex. Wright.
		Total tons...	60,000	
<i>Products of Mines and Quarries.</i> —Coal from Pictou for steam purposes; freestone, plaster, rough and calcined, grindstones, marble and slate, and ores. Coal from Sydney, via St. Peter Canal.	Pictou, Port Hood, Wallace, Cape Breton (west coast) Gloucester. New Sydney.	To United States' ports, West Indies, St. John. St. John.		H. A. Budden. F. Newbery. Hon. J. Boyd. A. Wright. Hon. J. Boyd. A. Wright.
		Total tons...	50,000	
<i>Miscellaneous products.</i> —Merchantize, vessels seeking short cut out and looking for cargoes; steamers, tugs, schooners and small craft generally going to winter in St. John.	Quebec and Gulf ports, P. E. Island.	To United States, and to St. John, and to winter in Bay of Fundy.		Report on Bale Verte Canal, page 11. C. Burpee, M. P.
		Total tons...	15,000	

ARTICLES OF COMMERCE.	FROM.	TOWARDS.	TONS.	AUTHORITY.
RETURN TRADE.				
<i>Tropical and semi-tropical products.</i> —Sugar, molasses, cotton, coffee, hides, tallow.	South America, Brazil, Guiana, West Indies, Southern States, and exchangeable at St. John for Western Canadian products and manufactures.	To Montreal, Quebec, Toronto, and all lake ports, also to Gulf ports and P. E. Island.		Hon. J. Boyd. Hon. J. Young, speech at Dominion Board of Trade, 1871. J. Pickard, M. P. C. Milner.
		Total tons....	60,000	
<i>Products of the mine.</i> —Bituminous coal of Nova Scotia.	From the collieries of Cumberland Co., South Joggins, Spring Hill, Hilbard, Lawrence, Milner and other mines of Macan and River Hebert.	Montreal, Toronto, Quebec, and all lake ports, also to P. E. Island and all Gulf ports.		Quebec Board of Trade. J. W. Lawrence, Alex. Wright, C. Milner. Hon. J. Boyd. Sen. Dickey, Hon. W. Muir head.
Also anthracite coal from Pennsylvania,	via St. John and direct.	To same ports. St. John and direct.	80,000	
<i>Products of the quarry.</i> —Olive, grey and brown freestone.	Dorchester, Hopewell, Harvey, St. Mary's Bay, Woody Point, St. George, Charlotte St. John County, Londonderry Mines, Five Islands and Minudie.	Quebec, Montreal, Toronto, and all cities and towns of the western provinces.		Hon. J. W. Lawrence. Hon. J. Boyd. Hon. R. B. Dickey.
Red granite. Grey Granite. Iron, marble, lime Grindstones, scythe and whet stones and ores.		Total tons....	50,000	
Plaster (gypsum) in the rough used as fertilizer, and manufactured calcined plaster.	Windsor, Martin's Head, Hillsboro, Shepody.	To Ontario and the west.		J. G. Tompkin W. Elder, M. P. P.
		Total tons....	40,000	
<i>Merchandise, manufactures and supplies.</i> —Being the return propeller cargoes in exchange for lumber from north shore N. B., N. S., and Quebec, and agricultural products of P. E. Island.	United States, St. John and Bay of Fundy ports.	To Quebec and all Gulf ports.		Hon. J. Young, Chamber of Commerce, St. John. J. Pickard, M. P.
		Total tons ..	35,000	
<i>Miscellaneous.</i> —The fishing fleets with bait and supplies, and other cargo, Vessels seeking cargoes, steamers, tugs, smacks and small craft.	Outfitted in United States or in Bay of Fundy or St. John.	For the Gulf Fisheries, Labrador, Anticosti, Bay Chaleur, Gaspé Basin.		Hon. J. W. Lawrence, Senator Dickey.
		Total tons....	30,000	
		GRAND TOTAL....	600,000	

Commercial Aspects of the Isthmian Transit.

The following is an extract from the petition of the Chamber of Commerce, St. John, Laughlan Donaldson, Esq., President, addressed to His Excellency Sir John Harvey, K. C. B., Lieutenant Governor, dated 18th June, 1833 :

"To detail to your Excellency the great advantages which would result to this Province from the existence of such a canal were needless. They are self apparent, and have been deeply considered by your Excellency ; but should a stranger observe that one part of your command is completely cut off from all water intercourse with another most extensive and important part of the Province, save by a voyage of eight hundred miles, while a canal of fifteen or seventeen miles through a peculiarly level country, would completely connect and bind them together, he would be astonished that no such attempt has yet been made to cut such canal. * * * * *

"That not only is New Brunswick in an especial degree interested in this undertaking, but that the extensive and growing trade between this port and Quebec, makes it certain that the Canadas would join warmly in promoting what would so much advantage their commerce. That various products of the eastern part of

Nova Scotia would find a ready and advantageous market at this port; that fleets of small vessels would be fitted out in this Province for general trade on the shores of the St. Lawrence and also for the Gulf Fisheries if such canal were completed. Another object of vast importance to the British Government as well as to the trade of the North American colonies and the West Indies seems likely to be attained by the completion of this work. *We refer to the opening of a safe and easy passage to Quebec several weeks earlier in the spring than can be reckoned upon by the present route and wholly avoiding the great danger of encountering the ice between Newfoundland and Cape Breton, or in the Gut of Canso.* We believe that it is well known that a clear passage along the northern shore of New Brunswick, and thence by Gaspé to Quebec, is generally open in the month of April, and frequently in its first week. That Prince Edward Island would be greatly benefited by such a canal; and that the trade of the whole colonies would thereby be increased in times of peace and their energies become closely united in time of war."

(Signed,) Isaac Woodward, (Signed,) LAUGHLAN DONALDSON,
Secretary. President.

"It would be difficult to point out all the advantages which would result to "Prince Edward Island, Nova Scotia and New Brunswick, by the construction of "the Baie Verte Canal. If the 900-ton propeller could deliver Western or Canadian "products at Halifax, or *St. John*, these places would thus become cheap depots for "such products. Assorted cargoes of fish, hoops, shooks, lumber, &c., could be made "up at these ports for the West India Islands and South America, and could bring "back return cargoes from those countries of sugar, coffee, hides, tallow, &c., to be "again *re-shipped as return cargo* to Canada and the Western States by the *inland pro- peller*, and thus be delivered *at less cost* by such means than by any other *possible* "route."—Speech of the late Hon. John Young at Dominion Board of Trade Meeting, 1871.

NOTES ON THE TRAFFIC, TOLLS, &c.

The trade with West India Islands and South America has been doubled since the above speech was made, and it has increased thirty-three per cent. the last five years. It rose from \$6,267,195 in 1876 to \$8,332,247 in 1881.

The output of coal in Nova Scotia during the last five years has increased fifty per cent. In 1877, it was 757,496 tons, and in 1881, 1,116,248 tons.

The total estimated tonnage—600,000 tons measurement—would make a daily average of about four vessels each way of 400 tons average during season of navigation.

Judge Haliburton, thirty years ago, estimated that ten vessels a day would pass through Baie Verte Canal, and some merchants have estimated the total amount of annual traffic at one million tons.

In any case the tonnage carried would be about equally divided between the five Provinces, Ontario, Quebec, New Brunswick, Nova Scotia and Prince Edward Island.

Nothing will illustrate the value of the Isthmian transit more than a study and appreciation of the actual distances of voyage saved as shown in the Table of distances.* These distances are correctly taken from the maps of the Chief Engineer of Government Railways upon the lines of the *shortest steamer* routes in all cases; sailing vessels being obliged to take a zigzag course would save a still greater distance by following the Isthmian Transit route. The tide would more safely and expeditiously carry them down the Bay of Fundy from Amherst Dock, than they could possibly weather Cape Canso or Cape Sable. Then all vessels trading in the Gulf,

* Vide page 11.

by the saving of time effected, could, on an average, make two voyages at the same expense for one they make now.

Remove the present Isthmian barrier to commerce, and the saving on freights to the United States would be of inestimable value to the merchants and people of Prince Edward Island.

The immense coal fields of Cumberland County are debarred and shut out from the markets of the Western Provinces, because the freight around the Capes Sable and Canso is prohibitory.

The bounty to be bestowed on the Fisheries will greatly stimulate this interest and cause vessels to be built and outfitted in the Bay of Fundy for this purpose.

Tolls.

The Baie Verte Canal was estimated by the Government Engineer to cost \$8,500,000 on a cash basis; were a company to build and undertake the operation of towing vessels through and maintaining it, their capital could not be less than \$12,000,000 to cover interest and maintenance. To obtain five per cent. dividends on this sum, the tolls would be required to be put at a rate that would be actually prohibitory to commerce, and prove as great a barrier to passing ships as the land itself. By the less costly Marine Transport Railway, with the assistance of the moderate subsidy asked from the Government, it will become a successful commercial enterprise without doubt. All fears of its practicability and injury to vessels will disappear as if by magic at the transport of the first loaded vessel from Gulf to Bay. From Baie Verte to St. John by Ship Railway will only take from 8 to 12 hours, whereas by the voyage around Nova Scotia it might occupy as many days. The tolls therefore should be regulated on the following principles:

1. To encourage and develop non-existent trade by low rates, and to prolong the inland navigation to St. John, N. B.
2. To discriminate as to nature and value of cargo, also size of vessel.
3. To compete with freights around the Atlantic Coast of Nova Scotia.
4. To carry at the lowest rates, consistent with a moderate return on the capital invested, until the Marine Railway is worked up to its full capacity, after which larger returns may be expected.
5. To make a small charge on the hull, as well as cargo, to be regulated on a sliding scale principle.
6. To have regard to the distance the cargoes have come in the manner railways do the products of the west.

To give an idea as to what may probably be the tolls charged, it is necessary to know the cost of carriage on a ship railway.

The prime cost of locomotive power on the Intercolonial Railway (St. John to Shediac) has been found to be one-third of one cent per ton per mile; applying this to 18 miles of Ship Railway there is a sum of six cents per ton only for haulage, add four cents per ton for raising and lowering the vessels and we have a total of 10 cents per ton for cost of carriage equal to 20 cents per ton on the cargo; add for administration, maintenance and repairs, another 20 cents, (one half their cost on an ordinary railway) and 50 cents per ton becomes a paying rate; but to cover interest on capi-

tal, the tolls would require to be higher in some cases. The company may be safely trusted to frame their tariff on a basis of justice to the public as well as themselves. The time occupied in transportation will be only two hours; by proper arrangements for passing each other, there may be forty or fifty vessels carried over the Marine Railway in a day.

Railways cannot compete with water carriage for bulky articles, such as would be carried by Marine Railway. Seventy to eighty cents per ton for 100 miles is the limit of cost for gross weight moved.

Navigation.

The tidal phenomenon of the Bay of Fundy is thus graphically described by Samuel Keefer, Esq., M. Inst. C. E., in his Report on the Baie Verte Canal published in 1873.

Bay of Fundy Terminus.—(Amherst Dock.)

The Bay of Fundy is remarkable for the extraordinary range of its tides. It is one of the wonders of the world, and the wonder is, that such a prodigious volume of water as enters and leaves it twice a day does not produce a greater commotion. On the direct course up the Bay to Cumberland Basin, and in the basin itself, there is no bore; the water being too deep and the course too direct to admit of such a phenomenon. Having observed the operation of the tides, both at Laplanche and Au Lac, I was surprised to see with what ease and regularity it was done. The surface of the great Basin rises and falls almost imperceptibly, all the while, preserving, in the absence of any wind, the placid appearance of a lake.

The range of the tide at St. John is 27 feet for springs and 23 for neaps, while, according to the Departmental survey, it is 48 feet for springs and 38 for neaps at the head of Cumberland Basin.

Here then, according to the moon's position, and the other causes which influence the tides, the water rises from 19 to 24 feet above the mean level of the sea, and falls from 19 to 24 feet below the same level, twice in every 24 hours. At one time the water is piled up to a height of 24 feet above the average level of the sea, and at another, just so much is taken out of the bay below that level. Like the oscillations of a pendulum, or the arms of a balance, these vast bodies of water vibrate about the neutral axis, represented by the average level of the sea; and furnish a striking example of the stupenduous forces that govern the motion of the tides—yet so gradual are the changes that, with care and skill, this bay can be navigated, except in bad weather, with perfect safety.

Baie Verte Terminus.—(Tidnish Dock.)

We find a minute description of this bay and the mode of access to it in the sailing directions for the Gulf and River St. Lawrence, published by Commander G. F. McDougall, R. N., 1871.

It will appear from reference to these directions and the admiralty charts, corrected up to 1867, that vessels can have no difficulty in making this entrance to the canal.

The piers run out from Roache's Head, which is situated two miles to the east-

ward of Tidnish Head, in a N. N. E. direction, so as to protect the lock-gates from the assault of the sea, and to favor the entrance and departure of vessels as much as possible from all winds, more especially from those from the eastward.

The entrance to this canal at Roache's Head is about ten miles N. N. W. of Pugwash Harbor, where, if necessary, vessels approaching from that direction can find good anchorage and shelter until the weather is favorable for running up to the canal.

The Canal entrance is protected from northerly and north-westerly winds by Cape Tormentine, and from the north-easterly winds by Prince Edward Island. The bay is only open to easterly winds, and the direction given to the piers is such as to give as great facilities as possible for entrance and departure.

TRADE.

Extracts from Report of Canal Commissioners, 1871.

The trade would be transport from Ontario and Quebec of flour and manufactures to St. John, Western Nova Scotia, Portland and Boston, and from the Upper Provinces and Northern New Brunswick of timber, freestone and provisions to American ports and the West Indies:—The Prince Edward Island trade hereafter referred to—the passage of American and Canadian fishing vessels to and from the Northern fishing grounds and the return voyages with West India produce, St. John and Nova Scotia manufactures, Bay of Fundy shad fish and Cumberland coal. Notably the latter article, declared by Sir William Logan to be the finest coal for all purposes yet discovered on the continent, would furnish return cargoes for all vessels from the St. Lawrence. These coal measures of unusual length and thickness at Spring Hill will be intersected by the Intercolonial Railway at a distance of about 25 miles from the Bay of Fundy terminus of the proposed Canal. The cost of transportation to Montreal, in view of the distance and return freight would inevitably be less than that of Sydney coal, which alone could be brought into competition with the Spring Hill coal for domestic use. Hundreds of American vessels would pass and repass through this Canal, and they could afford to pay toll, because it would enable them to make an additional voyage each season.—*Evidence of Hon. Senator Dickey.*

There is no public work now presented to the Dominion which will be so far reaching in its beneficial consequences not only to Canada, but to the whole of the Atlantic coast of North America. This Canal means, for Ontario and Quebec, cheaper coal, iron, stone, fish, leather, &c.; for Nova Scotia and New Brunswick, a better market for all these. It means cheaper flour and other products of the Upper, to us of the Lower Provinces—a larger market or rather greater facilities for supplying the United States, the West Indies and South America, with what we are now prevented from sending, owing to the distance and cost. It means to us *all* an immensely extended commerce, and to P. E. Island the necessity of a closer Union with these Provinces, which can offer her such advantages for commerce and manufactures. It will be one of the most powerful inducements to persuade her to join us, whilst it means the welding of us all together more closely in those bonds of commercial Union, which have so far proved so mutually beneficial, making us one people, because it will be *our interest* to be one, by building up our own country and opening every possible channel of communication that can cheapen our products, we will be in a position to be indifferent to the hostile legislation of other people. On the contrary such legislation will the more bind us to one another, as by a refusal of reciprocity in the past, we have been driven from old markets to new, so will it be in the future, and the intended curse will prove a substantial blessing.—*Evidence of Hon. Senator Boyd.*

DISTANCES SAVED.

Comparison of Distances shewing Saving of Voyage over present water routes to be effected by the construction of the Marine Transport Railway.

FROM.	TO.	Via Gut Canso.	Via Ship Railway.	Saving of Voyage.
		Miles.	Miles.	Miles.
Tidnish, Bale Verte	St. John	620	120	500
Montreal.....	St. John	1,315	930	*385
	Portland	1,395	1,165	230
	Boston.....	1,445	1,245	200
Quebec.....	St. John	1,155	770	385
	Portland.....	1,235	1,005	230
	Boston.....	1,285	1,085	200
Gaspé Basin, Q.....	St. John	750	365	385
	Portland.....	830	600	230
	Boston.....	880	680	200
Chatham, N.B.....	St. John	740	280	460
	Portland	825	515	310
	Boston.....	875	595	280
Bathurst, N.B.....	St. John	830	370	460
	Portland.....	910	605	305
	Boston.....	960	685	275
Richibucto, N.B.....	St. John	675	215	460
	Portland... ..	755	450	305
	Boston.....	805	530	275
Charlottetown, P.E.I.....	St. John	585	180	405
	Portland	665	420	245
	Boston.....	715	500	215
Summerside, P. E. I.....	St. John	635	175	460
	Portland.....	715	410	305
	Boston.....	635	490	275
Georgetown, P. E. I	St. John	545	225	320
	Portland	625	400	165
	Boston.....	675	540	135
Pictou, N.S	St. John	545	180	365
	Portland.....	625	420	205
	Boston	675	500	175
St. Peters Canal, N.S	St. John	465	280	185
Parrsborough, N. S	Tidnish, Bale Verte	630	120	510
Truro, N. S.....	do	720	160	560
Windsor, N. S.....	do	680	140	540
Digby, N. S	do	580	150	430
Yarmouth, N. S.....	do	490	220	270
Joggins Coal Mines, N. S.....	do	650	50	600
Moncton, N. B.....	do	700	60	640

* Per Report of Bale Verte Canal Commissioners, 225 miles; error, 160 miles.

† Do. do do 175 do ; error, 25 do

Do. do do 354 do ; error, 51 do

Propellers from Montreal and Quebec, calling at Gulf Ports via Straits of Northumberland, would save 430 miles. By the Report of Bale Verte Canal Commissioners the saving was put at 235 miles, being an error of 160 miles direct and 205 miles via Straits.—*Vide Report, page 13.*

OTTAWA, February 20th, 1882.

THE HONORABLE

SIR CHARLES TUPPER, C.B., K.C.M.G.,
Minister of Railways and Canals.

SIR,—I enclose for your perusal some letters from Mr. James Brunlees, Vice-President of the Institution of Civil Engineers, London; Mr. James B. Francis, then President of the American Society of Engineers; Mr. Edwin Clark, M. Inst. C. E., and others, touching the subject of the Chignecto Marine Transport Railway.

I have the honor to be, Sir,

Your obedient servant,

H. G. C. KETCHUM.

Letter from James Brunlees, Esq., Vice-President of the Institution of Civil Engineers.
5 VICTORIA STREET, WESTMINSTER, S.W.,
10th December, 1881.

DEAR MR. KETCHUM,—I have read with very great interest the description of your proposed Ship Railway across the Isthmus of Chignecto. It is more than twenty years since I first directed my attention to the subject of Ship Railways, and I am at the present time more than ever convinced that, under certain conditions, they offer the best and cheapest method of transit for goods. The whole circumstances of the Isthmus of Chignecto point it out as an exceedingly suitable spot for such a Railway, and I shall be very pleased to hear that you have succeeded in organizing a Company for the carrying out of your project.

Your practical experience on Railway Works of a special character, more particularly in respect to those on the inclines of the Sao Paulo line in Brazil, to my mind renders you peculiarly well qualified to carry out such an undertaking as the Chignecto Ship Railway.

I am, dear Mr. Ketchum,

Yours very truly,

JAMES BRUNLEES.

H. G. C. Ketchum, Esq., C.E.,
Fredericton, New Brunswick.

From Edwin Clark, Esq., M. Inst. C. E.

6, WESTMINSTER CHAMBERS, VICTORIA STREET,
LONDON, December 27th, 1881.

DEAR KETCHUM,—I have received and read with great interest your progress in the matter of the Ship Railway. I should have written earlier but I have been in France where I am erecting some canal lifts of very great magnitude, near St. Omer. I am erecting a lift for their heavy barges 60 feet high, and another series of four lifts at La Louvière, between the Saone and Garonne, altogether 41 metres. I am also erecting a very large one for the Belgian Government, and have others in progress. There is no doubt whatever, that for the moderate-sized vessels which you propose to deal with, the system you propose would prove most satisfactory and efficacious, and involves no engineering difficulty of any magnitude or importance. I need hardly say I shall be glad to afford any assistance or advice in my power. Wishing you the success you deserve and the compliments of the season.

Believe me ever, yours truly,

EDWIN CLARK.

H. G. C. Ketchum, Esq.,
Fredericton, New Brunswick.

From James B. Francis, Esq., President of the American Society of Engineers.

OFFICE OF THE PROPRIETORS OF LOCKS AND CANALS ON MERRIMACK RIVER,
22 BROADWAY, LOWELL, MASS., January 14th, 1882.

DEAR SIR,—I have read with much interest the pamphlet describing your pro-

ject of a Ship Railway, across the Isthmus of Chignecto, to connect the Bay of Fundy with Baie Verte, in the Gulf of St. Lawrence.

Projects of a similar character have been proposed and discussed by competent engineers for some years, and although none of them have been carried into effect, there does not appear to be any difficulty that cannot be met by well-known mechanical appliances. In your project the only additional difficulty that I see, is the effect of frost, which I observe you fully recognize, and I have no doubt could provide for in the manner you propose.

Very truly yours,
JAMES B. FRANCIS.

H. G. C. Ketchum, Esq.,
Fredericton, N. B.

EAST BOSTON, January 12th, 1882.

MY DEAR SIR,—For nearly fifty years, I have been more or less connected in some manner with ship railways; and for many years with all classes of docks and ways, for hauling out and repairing ships, and for 'about thirty-eight years, have owned a marine railway, and we have often taken ships out full of cargo and water. From the information which I have derived from you and your plans, I have no doubt but that your enterprise will be a success; and I trust you will soon have the great pleasure of seeing it in full and complete operation.

Very respectfully yours,
D. D. KELLY.

Mr. H. G. C. Ketchum.

OUT-PORT OF TIDNISH, Dec. 15th, 1881.

SIR,—I have the honor to transmit to you the following report respecting the opening and closing of navigation at this Port. From the spring of 1872 to the spring of 1879, vessels could arrive and leave in safety from the 23rd of April to the 4th day of December, some seasons much sooner and others later in the fall; the above is the mean by accurate observations taken by myself. Then from the fall of 1879, to 1881, 25th of April to 28th November; in fact, vessels could arrive and leave to-day.

Generally vessels could leave Tidnish much sooner in the spring than they could get through the Straits of Canso, as the ice blocks in the Straits and there is so much dense fog.

We generally have south-west winds and clear weather in the spring, and vessels could reach our northern ports two weeks sooner *via* Ship Railway across the Isthmus.

I am, Sir,

Your most obedient servant,
CAPT. J. C. BRUNDAGE,
Sub-Collector of Customs.

H. G. C. Ketchum, C.E.,
Sackville, N.B.

EXTRACTS from Mr. Eads' Pamphlet, giving letters of leading Engineers and Naval Architects as to the practicability of constructing and operating a Ship Railway.

Mr. John Fowler, the writer of the following letter, was consulting engineer of the Egyptian Government, engineer-in-chief of the Metropolitan (Underground) Railway of London, and is now constructing by far the largest bridge in the world. He is a past president of the Institute of Engineers in England, and a gentleman who is recognized as one of the ablest and most experienced of living engineers:—

2 QUEEN SQUARE PLACE, WESTMINSTER, September 4, 1881.

My Dear Sir: You will be interested to know that about eight years ago, when acting as consulting engineer to the Egyptian Porte, I was instructed to prepare a project for the transport of steamers and other vessels from one level to the other at the First Cataract of the Nile.

After a very careful investigation of the alternative plans of canal and ship rail-

way on the spot, I decided in favor of the railway, having satisfied myself that there was no mechanical difficulty in carrying ships of any size, without injury to themselves, on a properly designed car or cradle over a solidly constructed railway.

Yours very truly,

JOHN FOWLER.

Capt. James B. Eads.

The distinguished writer of the following letter, Mr. E. Leader Williams, was the chief engineer of the Trent and Mersey Canal and was the originator of the celebrated Anderton Lift, which unites the River Weaver with the canal by means of an ingenious arrangement by which a section of the canal, about 150 feet long and containing two barges and the water in which they float, weighing in all about 250 tons, is raised and lowered by simple hydraulic apparatus through the space of fifty feet.

This lift has been in operation for seven years without the slightest accident, and has given such satisfaction that the government of France has ordered one of four times its capacity to connect two different levels of one of the French canals, and the government of Belgium is now building four similar ones of still greater capacity:—

QUEEN'S CHAMBERS, JOHN DALTON ST., }
MANCHESTER, September 5, 1881. }

Dear Sir;—I consider your plan for a ship railway quite practicable, and that it may be developed into a sound commercial enterprise.

When I first proposed to lift loaded boats vertically fifty feet, so as to pass them in three minutes from the River Weaver to the Trent and Mersey Canal without locks, many persons considered my scheme visionary. You, however, have seen the lift at work, and it has now been in constant operation, without any hitch, for the past seven years.

I believe that your ship railway only requires carrying out into execution to prove most successful in every way.

Yours very truly,

E. LEADER WILLIAMS,
M. Inst. C. E.

James B. Eads, Esq.

The following letter is from the engineer now in charge of the Anderton Lift:—

WEAVER NAVIGATION, ENGINEER'S OFFICE, }
NORTHWICH, ENGLAND, October 20th, 1881. }

My Dear Sir:—Having been for five years employed in superintending and carrying out works of various descriptions in shipbuilding yards, including the construction of ships of large size, and the repair of ships on hauling up slips, and having for the last four years had charge of the Anderton Lift on this navigation, which is used daily for raising laden barges a height of fifty feet to transfer them to a canal on the upper level, I am satisfied that the proposal of Captain Eads to raise ships by mechanical means and convey them overland on a railway and on carriages especially designed for the purpose, is one which is feasible and ought to succeed; and that the strains on the hull may be more accurately calculated and provided for on land than is possible when ships are subject to the varying conditions inseparable from a sea passage in stormy weather. I remain,

Yours faithfully,

LIONEL B. WELLS,
M. Inst. C. E.

Sir. E. J. Reed, K.C.B., F.R.S., M.P.

Mr. Duer, the writer of the following letter, is an able civil engineer, who has devoted many years of his life to the study of hydraulic apparatus for lifting vessels.

6 WESTMINSTER CHAMBERS,
VICTORIA SQUARE, LONDON, September 2, 1881. }

CAPTAIN EADS, ETC., ETC.,

Dear Sir :—Previous to the day on which I had the pleasure of meeting you at Anderton, and of there explaining to you the details of the canal-lift, a ship railway was a subject to which I had never given serious attention, and for want of proper examination my prejudices were not favorable to it. Since that time I have, however, given a considerable amount of thought to this subject, and as I have for many years been in the habit of seeing ships standing out of the water on floating pontoons, and moved about in all kinds of weather at the Victoria Docks, my mind could easily pass to the consideration of a ship similarly mounted on a carriage on land; and when it is remembered that the ships at the Victoria and other hydraulic docks remain on the pontoons for days and weeks together, sometimes with their cargoes on board, I feel that there ought to be no doubt as to the safety of a ship at rest on a properly constructed carriage.

As all the details of the large hydraulic dock which was constructed ten years ago for the government of Bombay were entrusted to my care, and as this dock is capable of lifting any ship afloat, my experience fully justifies me in saying that the largest ship can be as readily placed on a carriage as a smaller one can.

When, again, I reflect on the nature of the strains to which a ship is subject at sea; the shocks that occur from the blows of heavy seas, and the large portions of the ship's surface that are at times entirely out of the water, I begin to wonder why any one should doubt that it would be as safe or even safer on a well-constructed railway than when so tossed and buffeted about in what we have hitherto regarded as its proper element. As I am not acquainted with railway travelling in America, I must call to your remembrance the ease and comfort with which one journeys on the London and Northwestern Railway of England. It is not difficult on this railway to forget altogether that one is travelling, while in a gale at sea this oblivion is impossible.

As a ship is ordinarily supported in a graving-dock on keel blocks with sile shores placed on the altars, as the level of the water in the dock falls, it must be considerably strained, as almost the whole of its weight is carried on the keel; but when the bilge-blocks are carefully introduced under water while the ship is afloat it must be almost, if not quite, as free from strain as when in smooth water. To avoid all danger from too much weight being carried on the keel, the bilge-blocks for the Bombay Dock were so designed that the ship on a pontoon can, if desired, be lifted entirely off its keel and the whole of its weight carried on the bilges. With a system of blocking so entirely under control, it is impossible that a ship can be injured while on a good carriage on a good railway, as the deck-beams must be amply sufficient to resist any outward thrust that can arise from the cargo. In a word, we may say, from long experience, that there is no danger or difficulty in placing a loaded ship on a carriage suitable for a railway, of transporting that ship and carriage from the water to the railway; and when this is done, I am of opinion that it will not be difficult to draw it quickly and safely across the Isthmus.

These and other considerations too numerous to trouble you with in a letter which has already become too long, have converted me from being skeptical to having perfect confidence in the railway you propose, and I hope that you may be enabled to carry out your project which, while being perfectly practicable, so far exceeds in grandeur anything that man has yet attempted.

I am, dear sir,

Yours faithfully,

SIDENHAM DUER.

The following letter is from the distinguished civil engineers, Clark & Standfield, who have had a most extensive and successful experience in lifting ships. Mr. Edwin Clark was the chief assistant of Robert Stephenson in the building of the celebrated tubular bridge over the Menai Straits, and is the engineer who introduced the hydraulic vertical lift system, the most notable example of this kind being at Bombay; another, of lesser capacity, at Malta; and still another at the Victoria Docks, in London, all of which works have given the most perfect satisfaction :—

6 WESTMINSTER CHAMBERS, }
LONDON, September 6, 1881.

CAPT. J. B. EADS, C.E.

Dear Sir:—Referring to our interview on the subject of the proposed ship railway across the American Isthmus, we now beg to say that our works are likely to be so much occupied during the next year that we should scarcely be in a position to execute any works out of England in connection with the proposed railway, but we should be very happy to prepare the drawings for the construction of the terminal works for lifting the vessels at the Atlantic and Pacific ports.

We understand it will be requisite to transport loaded vessels of the weight of 4,000 to 6,000 tons, more or less, on the railway, at the rate of about six miles per hour, on a gradient of one or two per cent., and that it will be required to raise the vessels on a railway car out of the water to a variable height not exceeding 46 feet, and deposit them on the rails in a time not exceeding thirty minutes. These conditions may be fulfilled in two different ways, and we need not say that it is a plan in which Mr. Edwin Clark has entire confidence, and in which he will take the fullest interest in arranging the details. The hydraulic system would probably be the most rapid but probably the more costly. At the Bombay Hydraulic Dock we have lifted weights up to 12,000 tons, with 72 presses, 14 inches diameter, and 36 feet stroke. The Victoria and Malta Hydraulic Docks have been many years in constant operation.

At the canal lift at Fontinettes we employ presses with rams, 6 feet 7 inches in diameter, with a 50-foot stroke. Each of these presses will raise a dead weight of 1,000 tons through a height of about 50 feet, in three minutes. The weight lifted is a movable portion of the canal, about 132 feet long, containing the water and a barge floating in it. This work is now in course of construction for the French government, and it is to be erected near St. Omer, in France, and we are now designing a set of four similar canal lifts for the Belgian government, in which the weight raised will be somewhat larger. It is evident that a few presses such as these would more than accomplish the work required.

Our ordinary depositing dock, similar to that at Sebastopol, which raises vessels of 6,000 tons, would also meet the requirements of the case very satisfactorily. We are now constructing a second of these docks, of 10,000 tons, for the Russian government at Vladivostok, and a third, of 3,000 tons, for the Barrow and Railway Company, at Barrow-in-Furness, to be afterwards increased to 5,000 tons. We have designed one of these docks for the Italian government, to raise iron-clads of 15,000 tons' weight with a lift of 30 feet. There would be no difficulty in modifying the proportions so as to render it suitable for a lift of 46 feet, and this form of dock raises the vessels out of the water and deposits them on a gridiron stage in a most convenient manner for railway transport.

It will probably depend to a great extent on their relative cost as to which of these systems may be adopted, and we shall be prepared at any time to go into the necessary calculations, and render every assistance in our power towards the accomplishment of the great work in which you are engaged.

We apprehend no difficulty in perfecting the necessary details of the plans so as to insure the safe transportation of the largest loaded ships on the railway cars with absolute safety.

We remain, dear sir, yours faithfully,
CLARK & STANDFIELD.

The writers of the following letter are the contracting engineers who constructed the Anderton Lift and the hydraulic docks at Malta and at Bombay. The execution of these works was so satisfactory as to prompt the most flattering testimonials in their behalf:—

HEATON FOUNDRY, STOCKPORT, October 1, 1881.

JAMES B. EADS, ESQ., C. E.

My Dear Sir:—When you are ready to commence the construction of your ship railway, we shall be pleased to undertake the building and completion of the necessary works for placing the ship, with her cargo, on the railway track, ready for attaching the locomotives to her, and after transport across the Isthmus to lower her

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safely again until she is afloat. A lifting apparatus will be required at each side of the isthmus which will lift or lower ships as required. This portion of the work we are fully prepared to execute with the greatest promptness, on the same terms on which we built the hydraulic docks at Bombay and Malta, and the Anderton Canal Lift in Cheshire.

We have no hesitation in guaranteeing the lifting of a fully loaded ship or steamer of 8,000 or 10,000 tons weight on a railway car from the sea or harbor level to that of your permanent way in 30 minutes, with absolute safety to the ship and the works where the lift is not over 50 feet vertically. We will undertake to construct all the plans and works necessary to do this at each end of your line, and complete everything ready for attaching the locomotive to the car on which the ship is to be lifted and transported; this car, or any number of them, we will furnish also.

The locomotives and railway construction are not in our line; but if it were a matter of importance to cover, in addition, the construction of the locomotives, turntables, etc., and ten miles of railway, as proposed by you to the United States, we have no doubt we could unite with us some other responsible parties engaged in that kind of works, to execute them and guarantee the safe transportation of the loaded ships of the weight mentioned, over the railway.

Very truly yours,

EMMERSON, MURGATROYD & Co.